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DEPT. OF NATURAL RESOURCES

Nebraska Department of Natural Resources Preliminary Republican River Basin Forecast for 2023

November 15, 2022

Nebraska Department of Natural Resources (NeDNR)

Agenda:

- Preliminary Forecast and Accounting
- Augmentation Impacts
- Hydrologically Balanced Assessment

Preliminary Forecast and Accounting

Topic Outline

- Final 2021 Accounting
- Preliminary 2022 Accounting
- Early Dry-year Forecast (2023)
- Compact Call Year Evaluation Flow Chart
- Forecasted NRD Projections for 2023

Final 2017-2021 Accounting

Hardy Balances, Table 3C	LRNRD	MRNRD	URNRD
2017	3,900	14,700	17,300
2018	8,700	3,600	-10,800
2019	32,700	44,400	75,900
2020	23,500	21,200	25,000
2021	5,200	9,200	12,500
2017-2021	74,000	93,100	119,900
Remaining Compact Compliance Volume (RCCV)	-2,460	-2,760	-360

*Units are acre-feet unless otherwise noted.

**Values throughout accounting and forecast presentation rounded to nearest 100. Sum of subtotals may not equal totals due to rounding.

Final 2020-2021 Accounting

Guide Rock Balances, Table 5C	LRNRD	MRNRD	URNRD
2020	19,700	17,100	19,000
2021	4,800	8,600	11,800
2020-2021	24,500	25,700	30,800
Remaining Compact Compliance Volume (RCCV)	-2,460	-2,760	-360

Preliminary 2022 Accounting

Year	Item	Information Source
Provisional Data for T=0 (Current Year or Immediate Past Irrigation Season)	Pumping	Prior year pumping
	Surface Water Use	Estimated from preliminary data and previous years values
	Streamflow	Available provisional records – end-of-year estimated
	Evaporation	Prior year records and provisional data

Preliminary 2022 Accounting – Guide Rock with Management Actions

Guide Rock Balances, Table 5C	LRNRD	MRNRD	URNRD
2021 (final)	4,800	8,600	11,800
2022 (projected)	-4,200	-3,300	-7,000
2021-2022	600	5,300	4,800
Remaining Compact Compliance Volume (RCCV)	-1,640	-1,840	-240

Preliminary 2022 Accounting: Hardy with Management Actions

Hardy Balances, Table 3C	LRNRD	MRNRD	URNRD
2018-2021 (final)	70,100	78,400	102,600
2022 (projected)	-3,000	-1,700	-4,700
2018-2022	67,100	76,700	97,900
Remaining Compact Compliance Volume (RCCV)	-1,640	-1,840	-240

Early Dry-Year Forecast (2023)

Dry-Year Forecast

Year	Item	Information Source
Forecast Year T+1 (Coming Irrigation Season)	Groundwater Consumptive Use and Imported Water Supply Credit	Average Values for T=0 and T-1
	Surface Water Consumptive Use	Colorado: Average of T-1 and T-2 use Kansas: $+(0.1858 \times \text{HCLcontent}) + 9,575$ Nebraska: $-(4 \times 10^{-7}) \times (\text{NE lake volume})^2 + 0.52 \times \text{NElakeVolume} - 42,000$
	Streamflow	$(5\text{-year average of state line flows}) \times 0.41 + 0.23 \times \text{HCLcontent} - 27,450$

Compliance Balances

The first year of a Compact Call Year contains a cushion of 10K AF if dry conditions continue.

Year	Guide Rock Balance (AF)
T=0 (2022, projected)	-14,500
T=+1 (2023, early forecast)	-8,100
2-Year Forecast Balance	-22,600

Year	Hardy Balance (AF)
T=-3 to 0 (2018-2022, projected)	241,800
T=+1 (2023, early forecast)	1,000
5-Year Forecast Balance	242,800

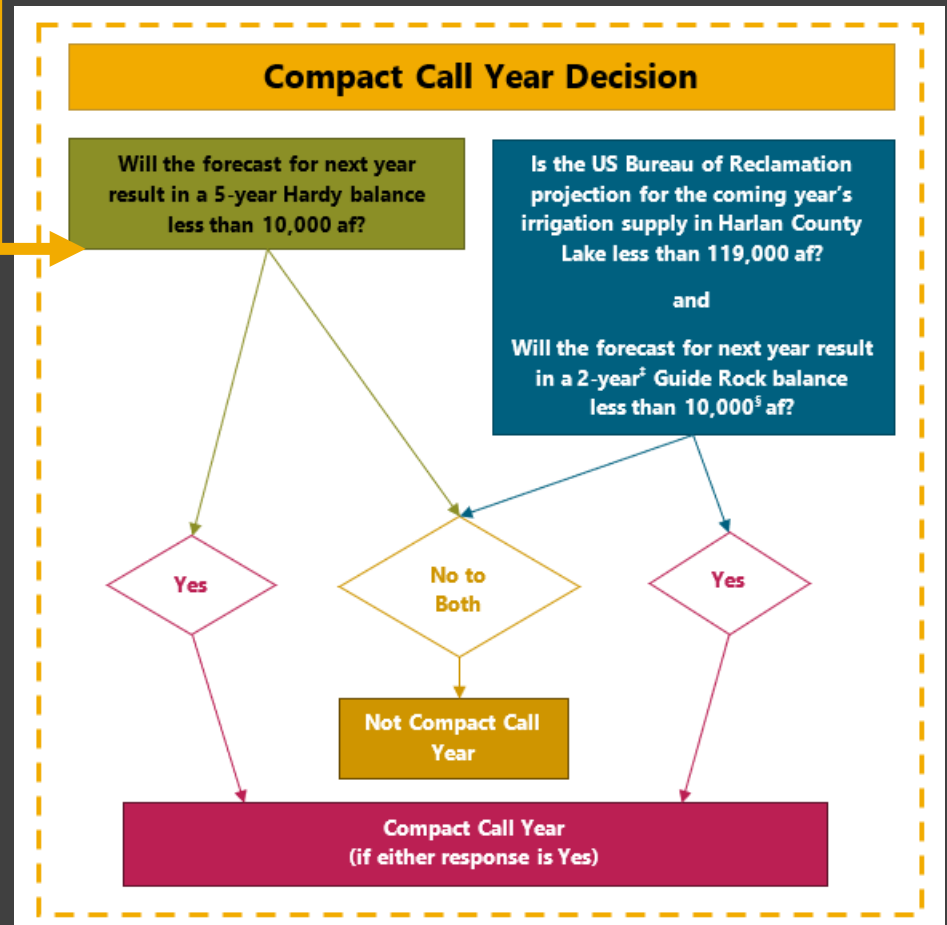
Year	Guide Rock Balance (AF)
T=+1 (2023, early forecast) with 10K AF Cushion	-18,100
2-Year Forecast Balance with 10K AF Cushion	-32,600

Year	Hardy Balance (AF)
T=+1 (2023, early forecast) with 10K AF Cushion	-9,000
5-Year Forecast Balance with 10K AF Cushion	+232,800

Compact Call Year Evaluation:

Will the forecast for next year result in a 5-year Hardy balance less than 10,000 AF?

Year	Hardy Balance (AF)
5-Year Forecast Balance	242,800
5-Year Forecast Balance with 10K AF Cushion	232,800



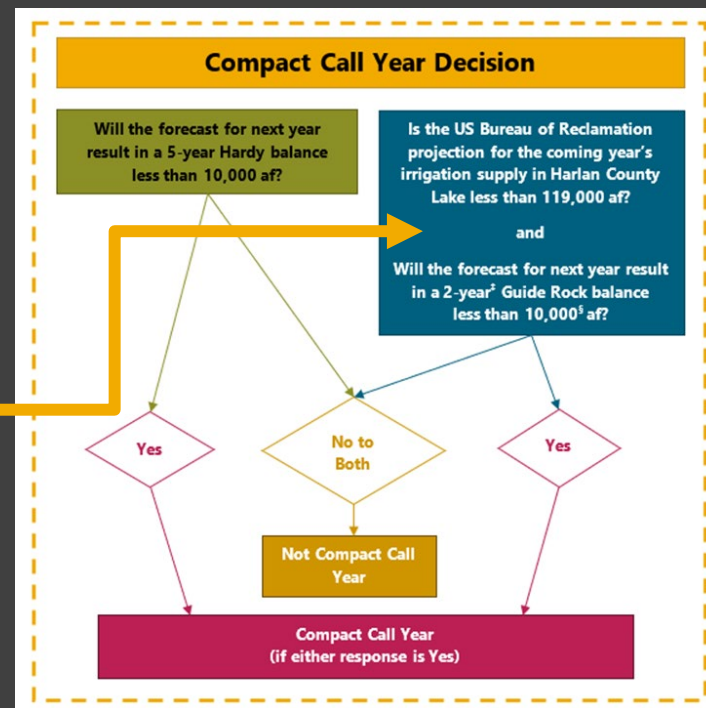
No.

Compact Call Year Evaluation:

Is the US Bureau of Reclamation projection for the coming year's irrigation supply in Harlan County Lake less than 119,000 AF?

AND

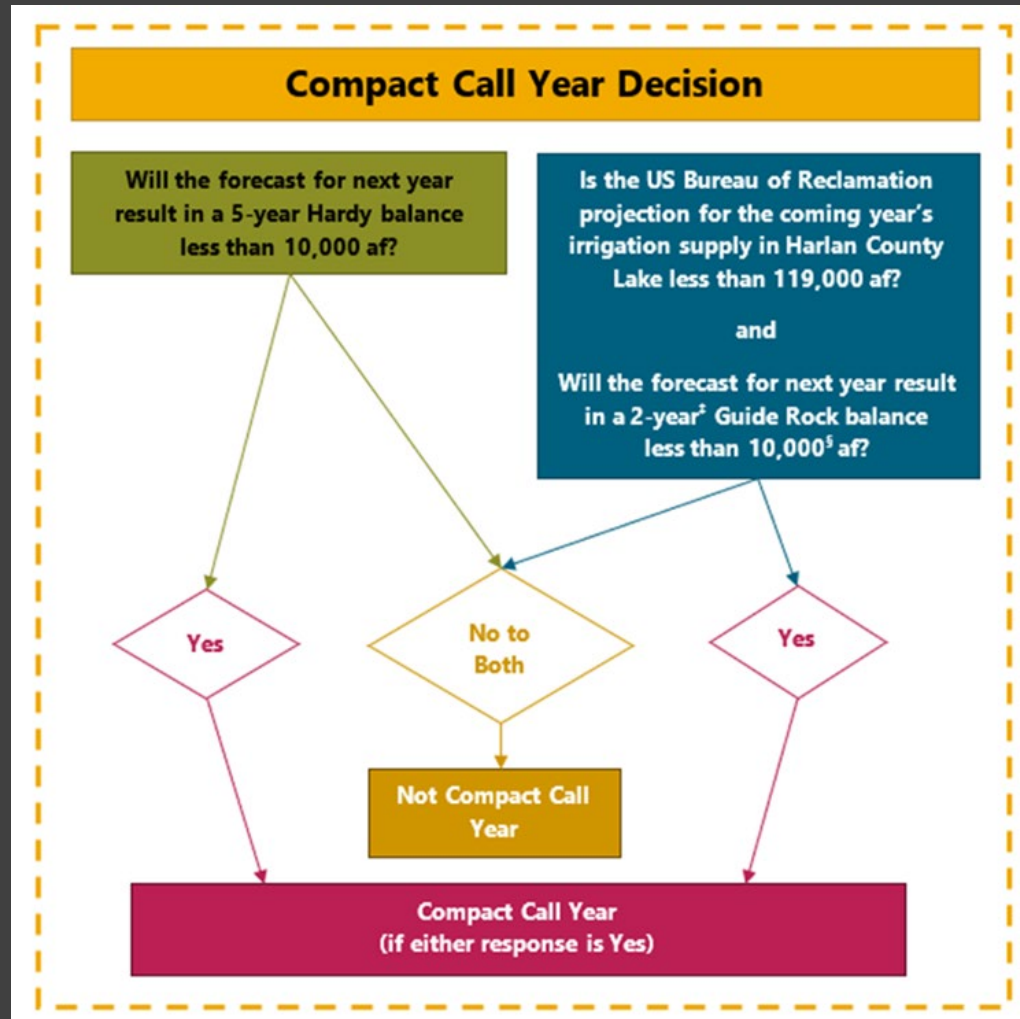
Will the forecast for next year result in a 2-year[†] Guide Rock balance less than 10,000 AF?



Yes, to Guide Rock balance.
Yes, to Harlan County Lake Irrigation Supply.

Year	Guide Rock Balance (AF)
2-Year Forecast Balance	-22,600
2-Year Forecast Balance with 10K AF Cushion*	-32,600
Harlan County Lake Irrigation Supply	112,900

Compact Call Year Evaluation: Yes- It will be a Compact Call Year.



NRD-Specific Forecast Balances

NRD Annual Guide Rock Balance Forecast for Upcoming Year (2023)

	LRNRD	MRNRD	URNRD	Total
Allowable Depletion Distribution Percentage from IMPs	24.5%	31.1%	44.4%	100.0%
Allowable Groundwater Depletions	37,600	47,700	68,100	153,400
Projected Groundwater Depletions	42,700	46,800	72,000	161,500
2023 Forecast Balance (no action)	-5,100	900*	-4,000	-8,100
2023 Forecast Balance (no action) 10K AF	-15,100	-9,100*	-14,000	
2022, projected	-6,400	800*	-8,900	-14,500
2-Year Forecast Balance	-11,400	1,700	-12,900	-22,600
2-Year Forecast Balance 10K AF	-21,400	-8,300	-22,900	
RCCV	-820	-920	-120	-1,860

NRD Annual Hardy Balance Forecast for Upcoming Year (2023)

	LRNRD	MRNRD	URNRD	Total
Allowable Depletion Distribution Percentage from IMPs	25.3%	30.8%	43.9%	100.0%
Allowable Groundwater Depletions	41,700	50,800	72,000	164,500
Projected Groundwater Depletions	45,100	46,800	72,000	163,900
2023 Forecast Balance (no action)	-3,400	4,000*	400	1,000
2023 Forecast Balance (no action) 10K AF	-13,400	-6,000*	-9,600	
2019-2022, projected	51,500	90,300	98,400	240,200
5-Year Forecast Balance	48,100	94,300	98,800	241,200
5-Year Forecast Balance 10K AF	38,100	84,300	88,800	
RCCV	-820	-920	-120	-1,860

Summary

- Based on the preliminary forecast, the IMP checklist indicates that 2023 will **BE** be a **Compact Call Year**.
- Preliminary approximate 2022 accounting balances:
 - Guide Rock: **-14,500 ac-ft**
 - Hardy: **-9,400 ac-ft**
- Preliminary dry-year forecast balance for 2023 currently approximated at **-8,100 ac-ft** at Guide Rock and **+1,000 ac-ft** at Hardy
- RCCV on January 1, 2023, will be **-1,860 acre-feet**
- Preliminary dry-year forecast for 2023 with the **-10K AF cushion** is currently approximated at **-18,100 ac-ft** at Guide Rock and **-9,000 ac-ft** at Hardy.
 - Two-year Guide Rock balance can be up to **-32,600 ac-ft with 10K AF cushion**.

Next Steps

- Preliminary Forecast and Basin-Wide Meeting
 - Participants can discuss the forecasted streamflow and surface water consumptive use.
 - From these discussions, surface water project sponsors may present a plan to NeDNR to achieve a consumptive use that is less than forecasted consumptive use. Such a plan could allow surface water project sponsors to avoid a potential Compact Call Year.
- Final Forecast and Compact Call Year Determination
 - NeDNR will publish the final forecast before January 1 of each year as required by Neb. Rev. Stat. § 46-715(6), including both short and long-term forecasts and whether a Compact Call Year will be designated.
 - If any potential deficit between allowable and forecast depletions is projected, that information will also be included with the final forecast.
- <https://dnr.nebraska.gov/water-planning/lower-republican-nrd>

Timeline

- **December 2022:** NeDNR notifies the NRDs in writing that the following year will be a Compact Call Year and notifies the NRDs how much yield from potential management actions may be needed within the CCY.
- **January 2023:** The NRDs notify NeDNR in writing about planned management actions to ensure Compact compliance.
 - NeDNR then issues orders to implement surface water controls.
- **Late February or early March 2023:** NeDNR provides a written assessment of the NRDs' planned management actions. If NeDNR determines that proposed management actions are insufficient to ensure compliance with the Compact, the IMPs, or the Republican River Basin-Wide Plan, the NRDs will implement additional controls to make up the remaining deficit.
- **April 2023:** NeDNR notifies Colorado, Kansas, and relevant federal agencies in writing about preliminary management actions and the anticipated water yield.

Timeline

- **May-December 2023:** NeDNR provides monthly preliminary accounting estimates to the NRDs, Kansas, Colorado, and the Bureau.
 - 10th of every month
- **June 2023:** NeDNR notifies Colorado, Kansas, and relevant federal agencies in writing about management actions taken and to be taken, and the anticipated water yield.
- **June 30th 2023:** Bureau finalizes Water-Short Year designation.
- **October 1st 2023:** Nebraska and Kansas review accounting;
 - Kansas can request remaining Compact compliance volume (RCCV).
- **September–October 2023:** NeDNR notifies the NRDs in writing about the assessment of NRD management actions and identifies specific additional management actions that are required by each NRD.

Augmentation Impacts

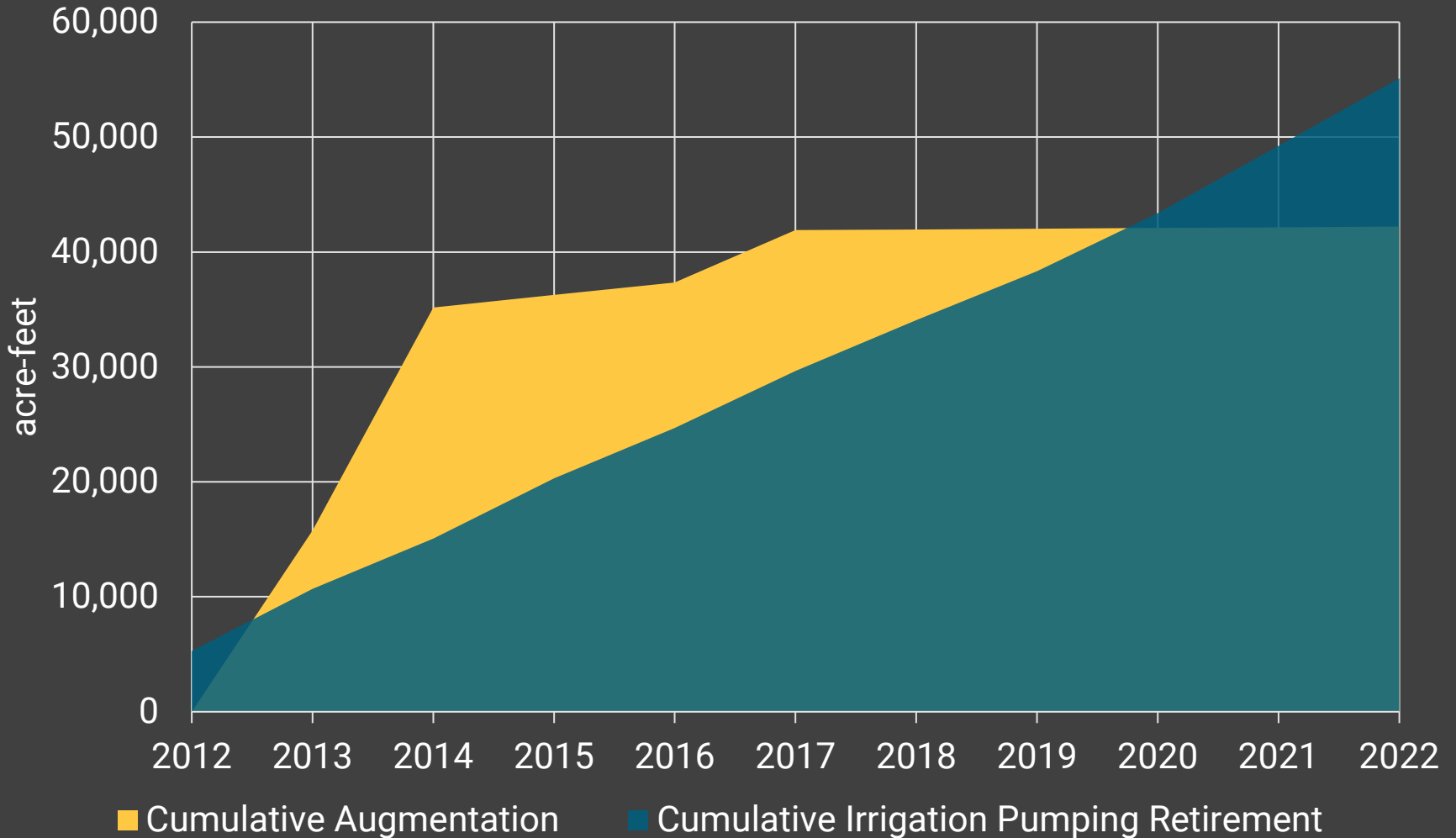
Augmentation Impacts – IMP

Our IMPs state:

“...NeDNR will annually evaluate whether offsets are necessary to mitigate new net depletions resulting from augmentation pumping or other management actions.”

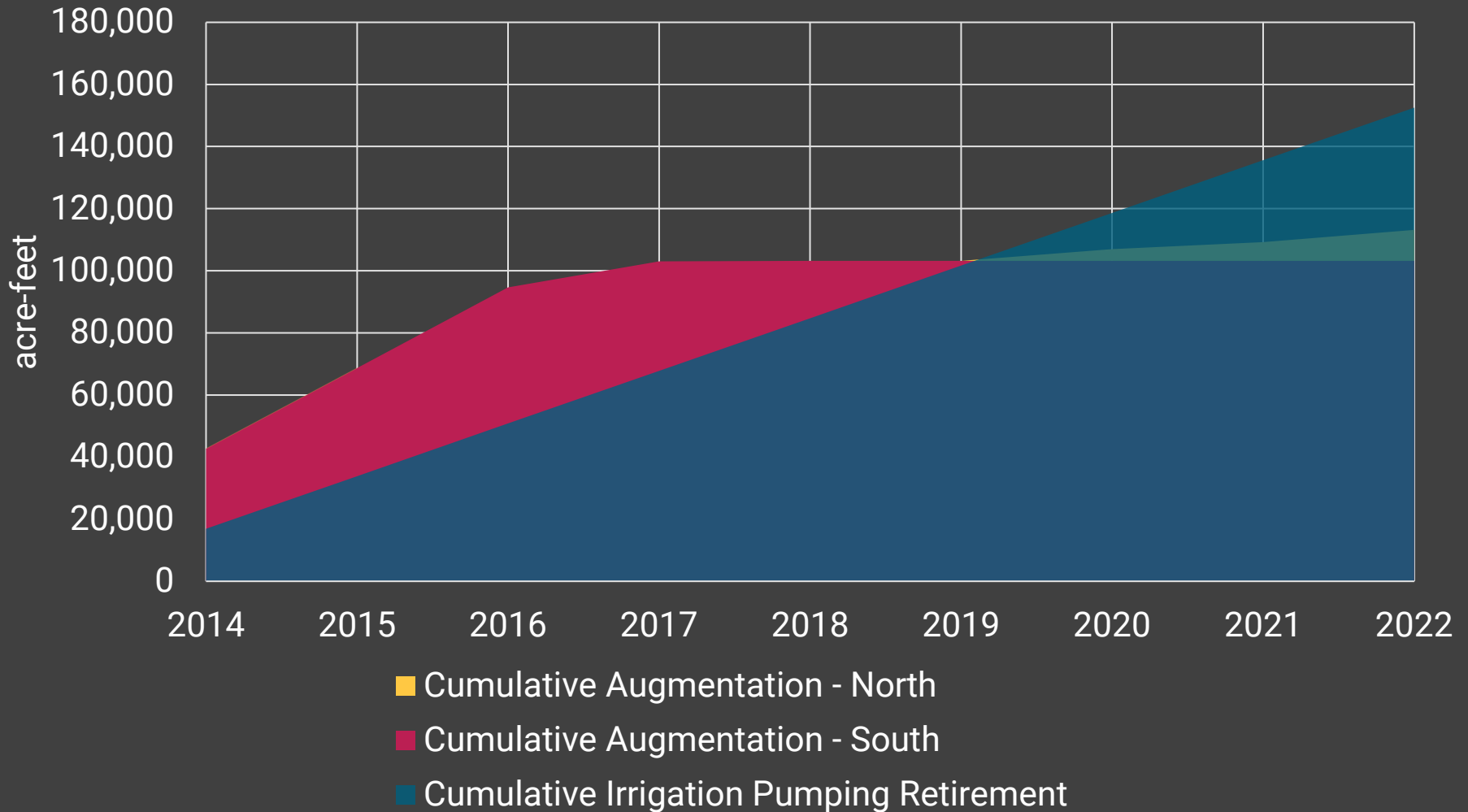
Augmentation Impacts – Model Inputs

Rock Creek



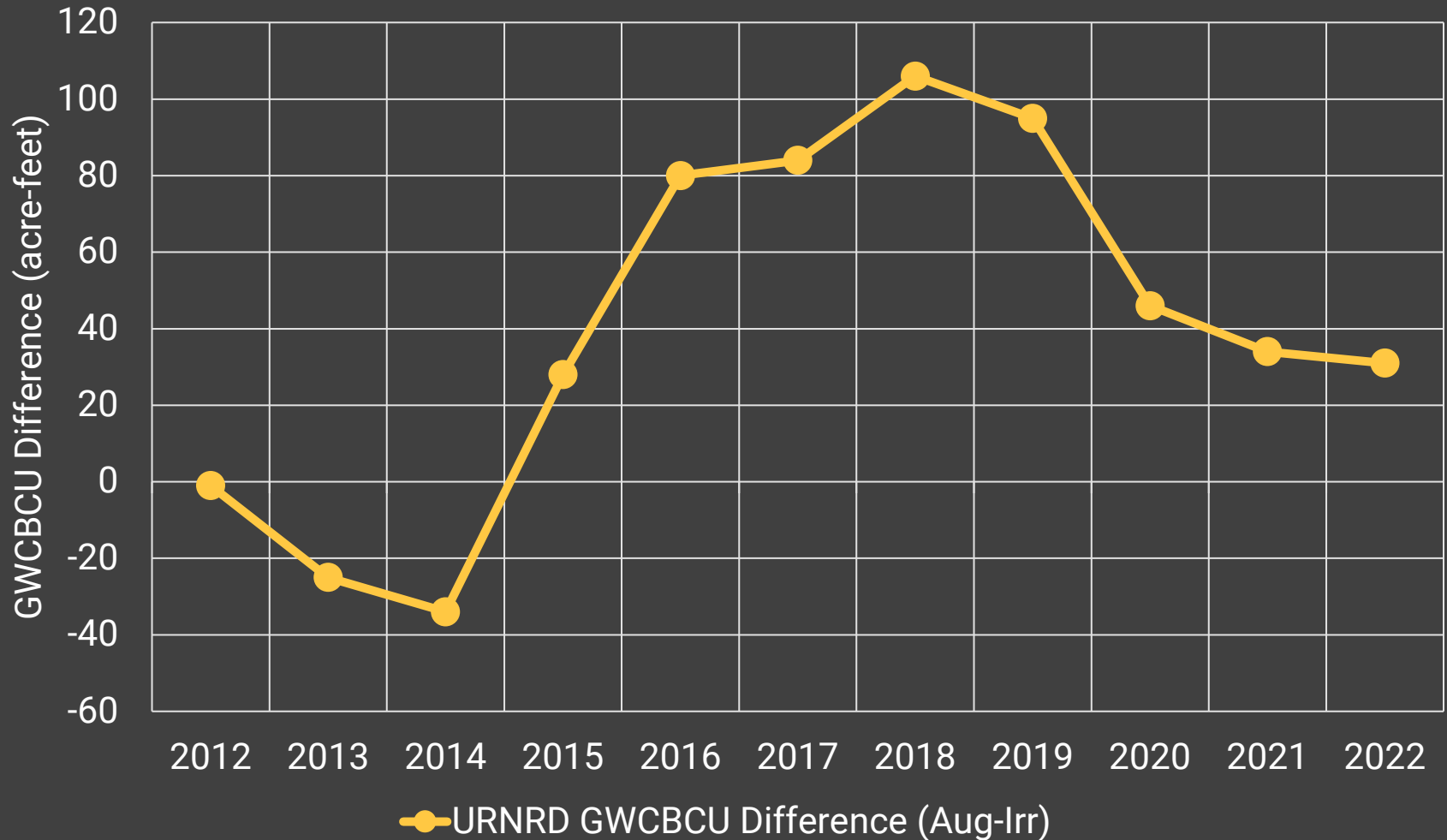
Augmentation Impacts – Model Inputs

N-CORPE



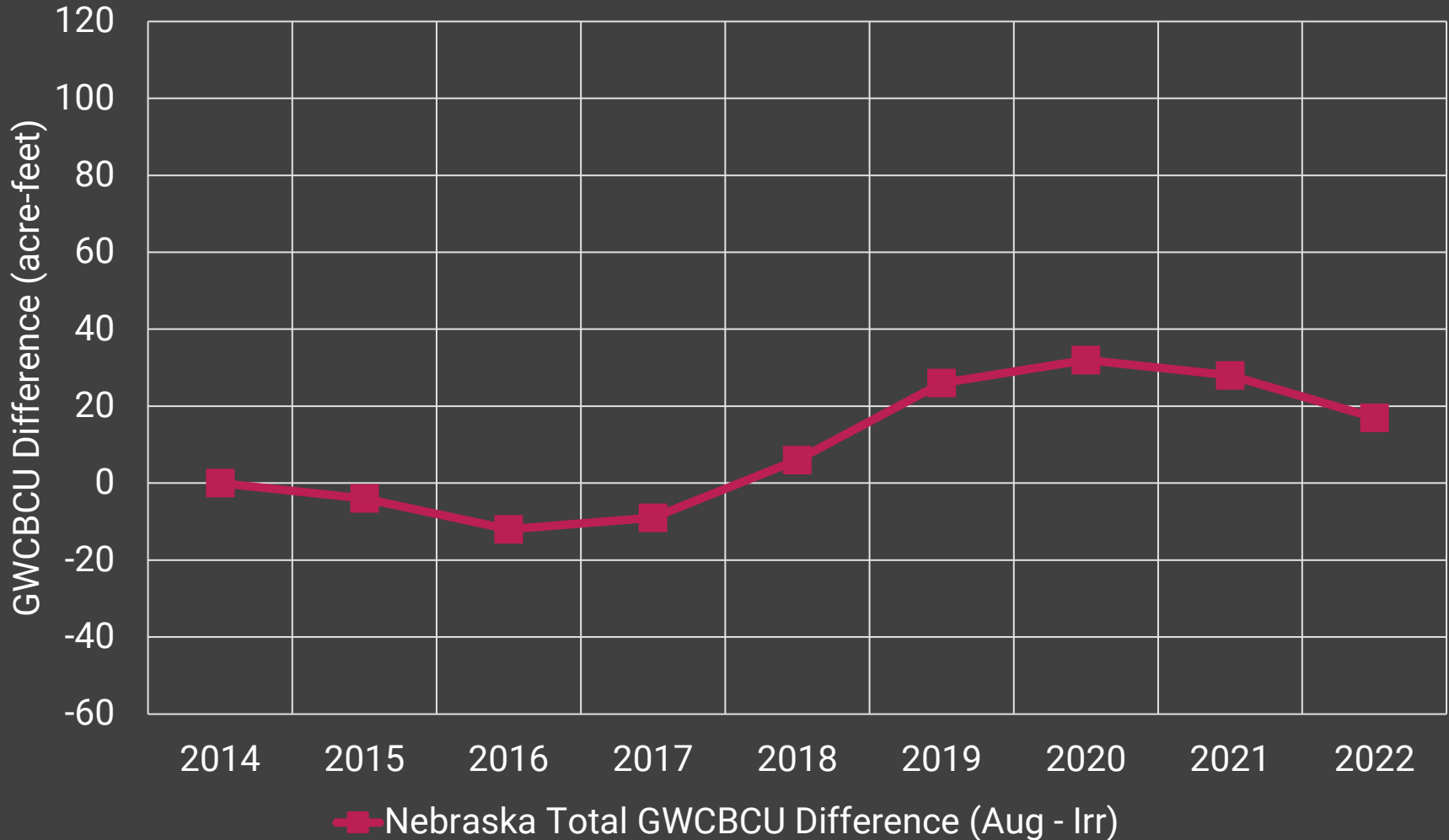
Augmentation Impacts – Sep. 2022 run

Rock Creek Impacts



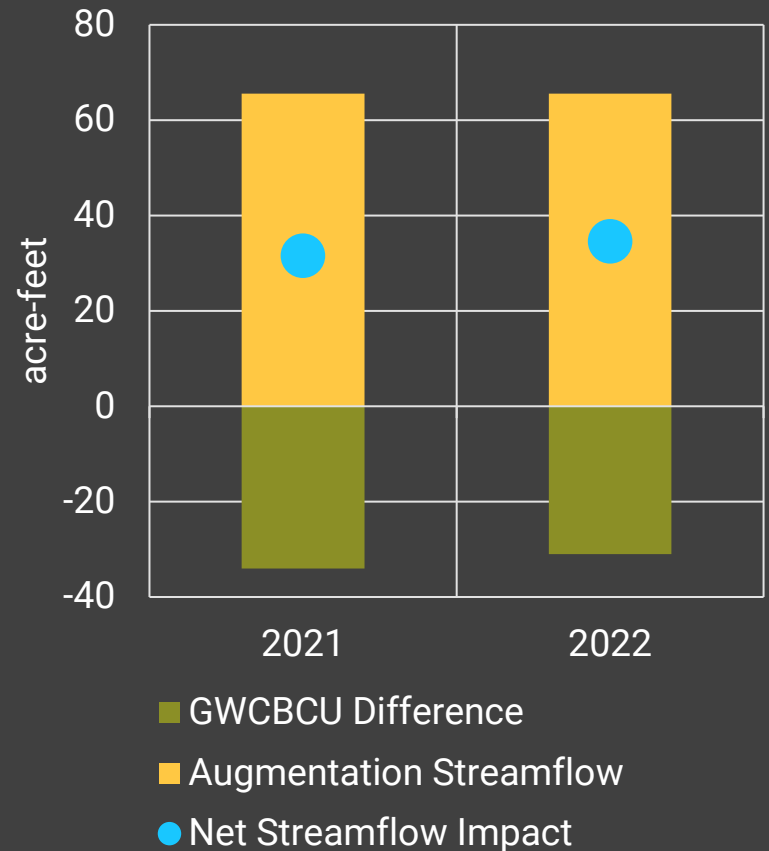
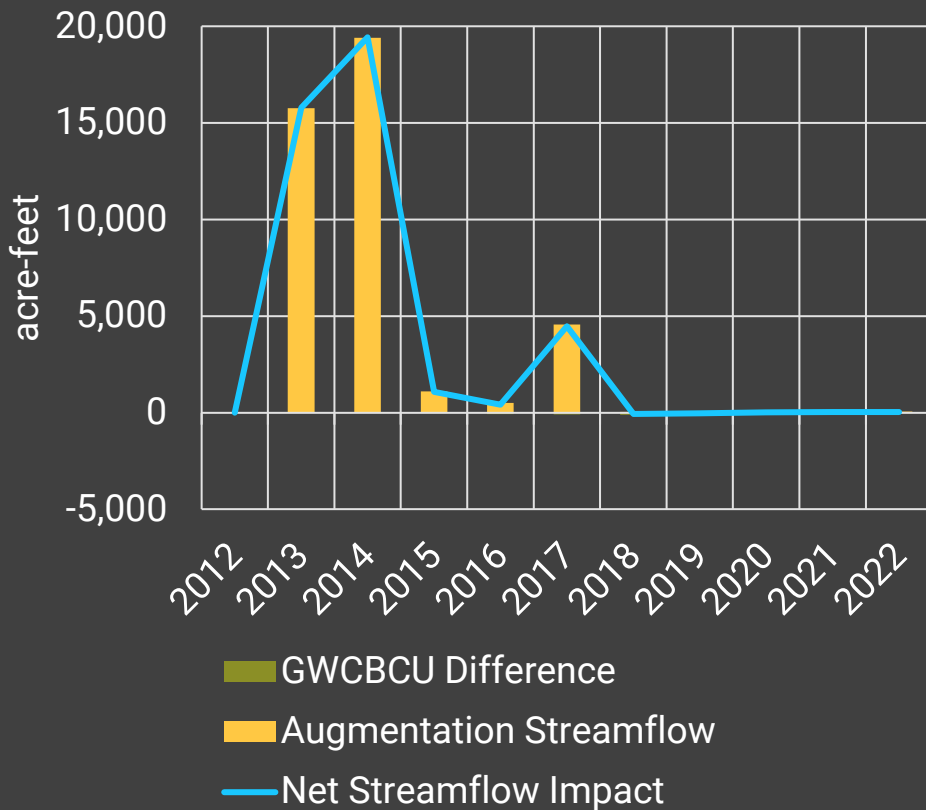
Augmentation Impacts – Sep. 2022 run

N-CORPE Impacts



Augmentation Net Streamflow Impacts – Rock Creek

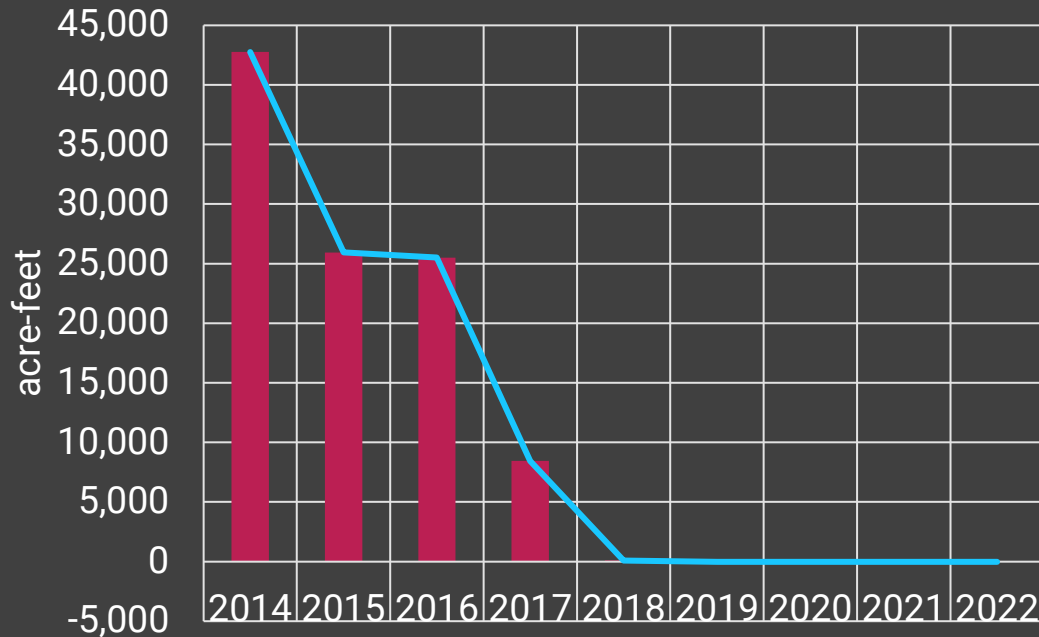
Rock Creek Augmentation Net Impacts to Streamflow



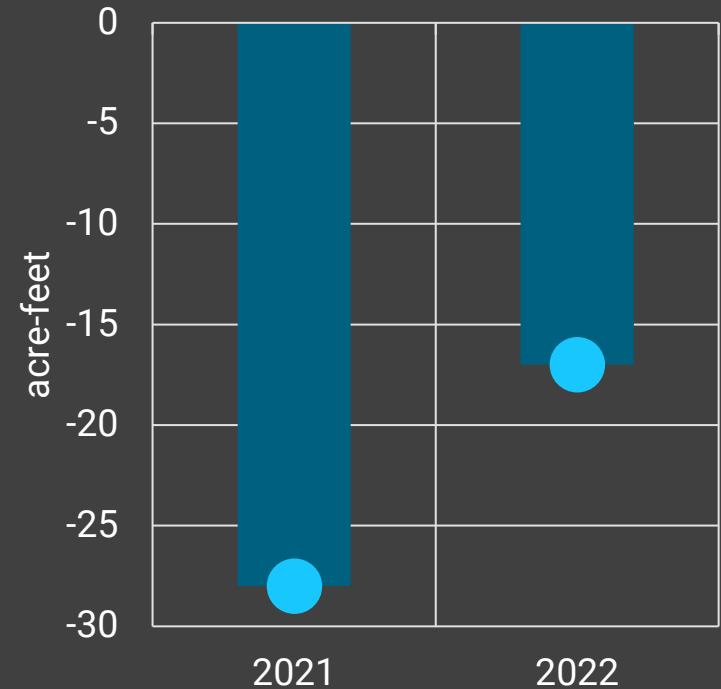
*Augmentation streamflow assumed to occur in same year as pumped; 2021 pumping repeated for 2022

Augmentation Net Streamflow Impacts – N-CORPE

N-CORPE Augmentation Net Impacts to Streamflow



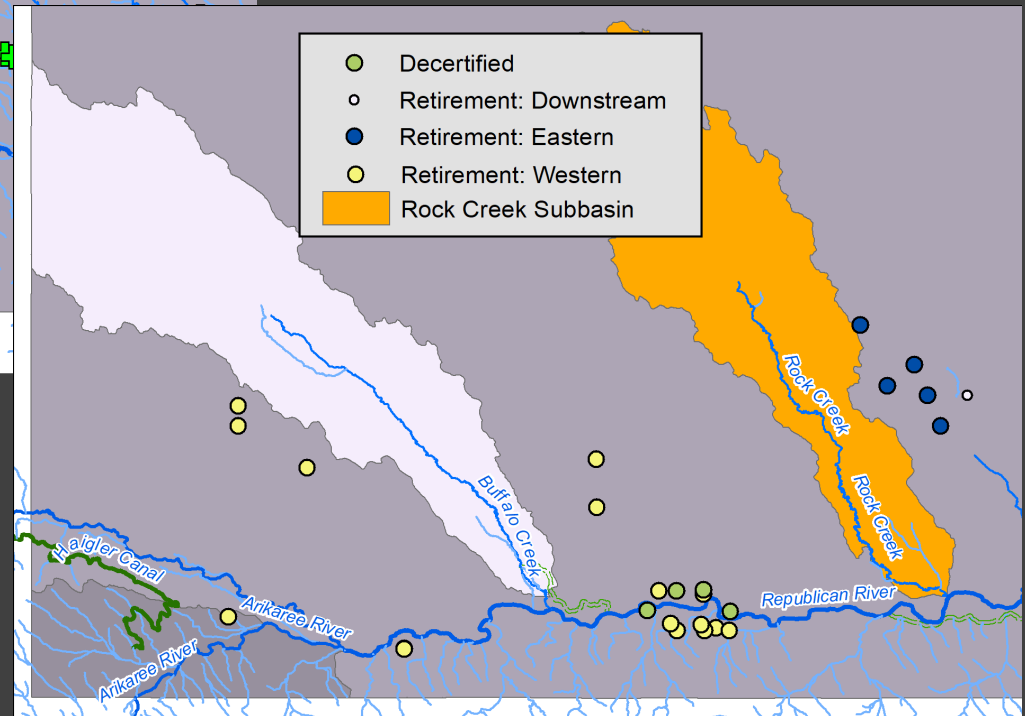
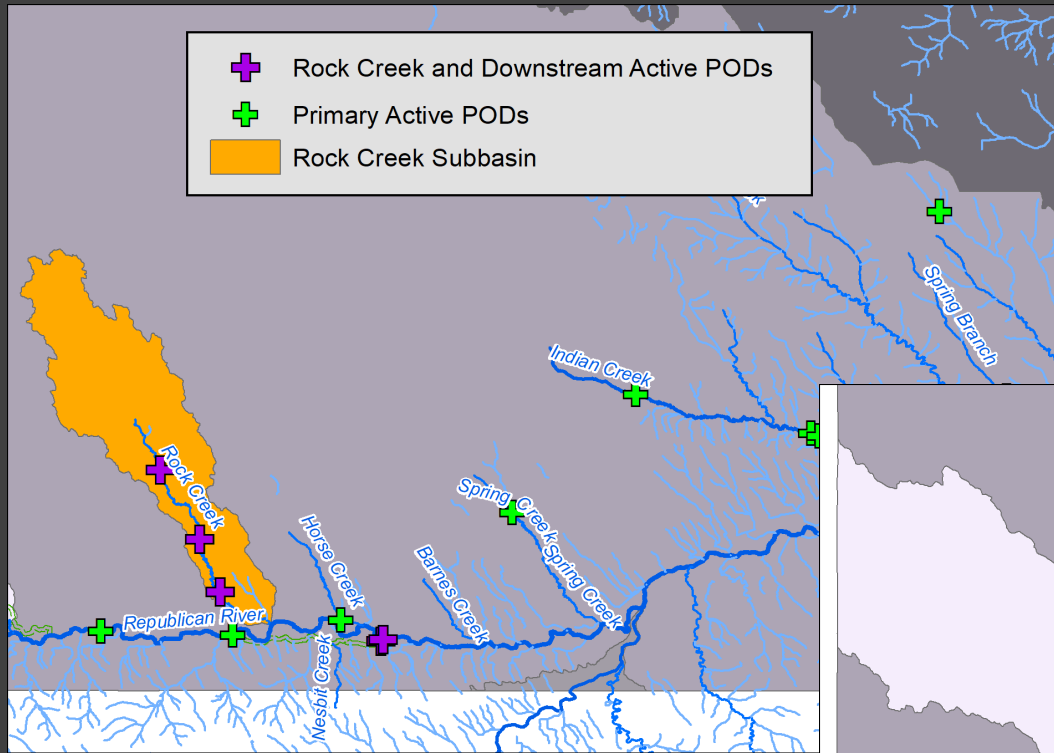
- GWCBCU Difference
- Augmentation Streamflow
- Net Streamflow Impact



- GWCBCU Difference
- Augmentation Streamflow
- Net Streamflow Impact

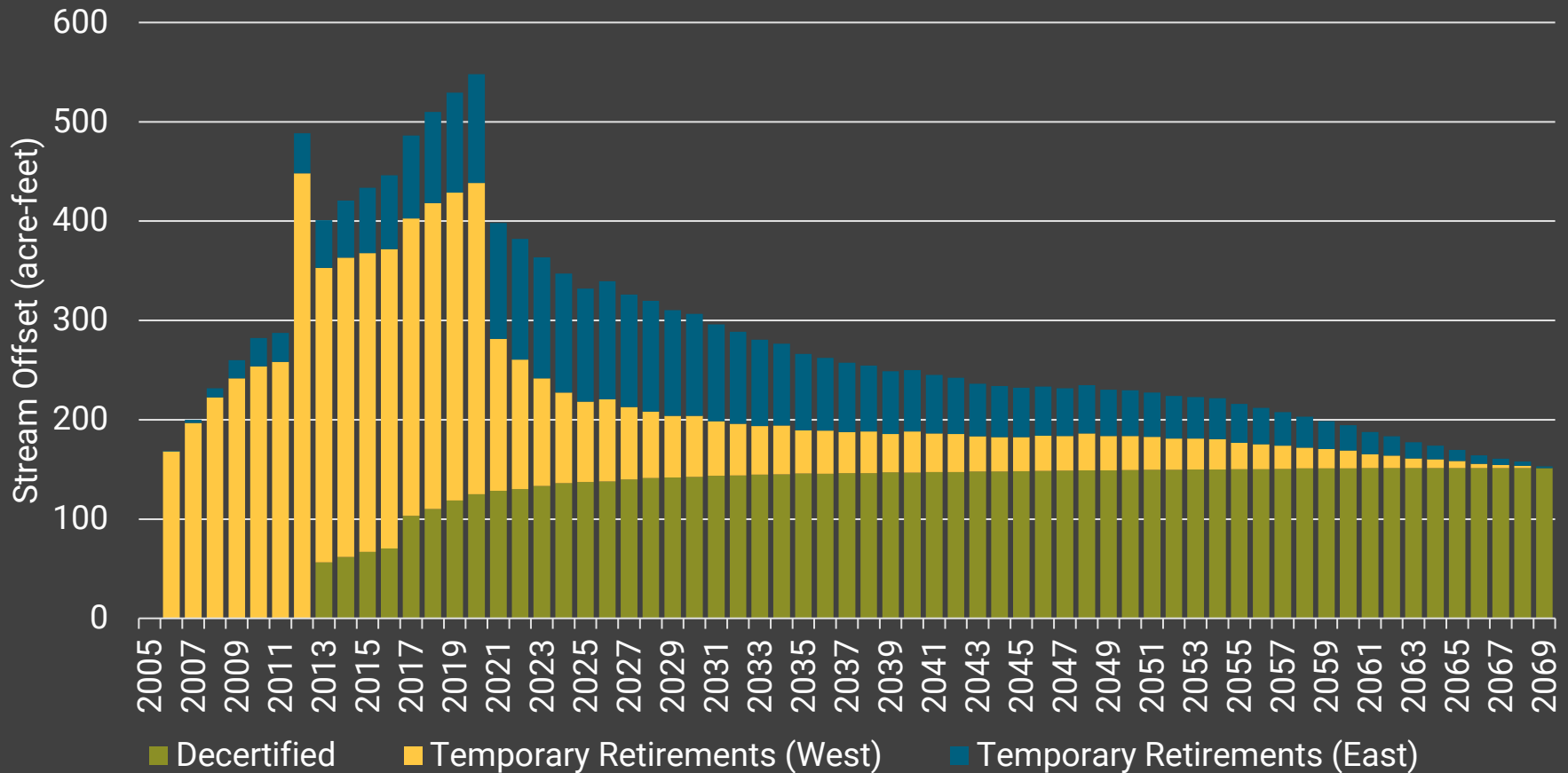
*Augmentation streamflow assumed to occur in same year as pumped; 2021 pumping estimated from year-to-date records and NCORPE AOP

Augmentation Impacts – Rock Creek Offsets



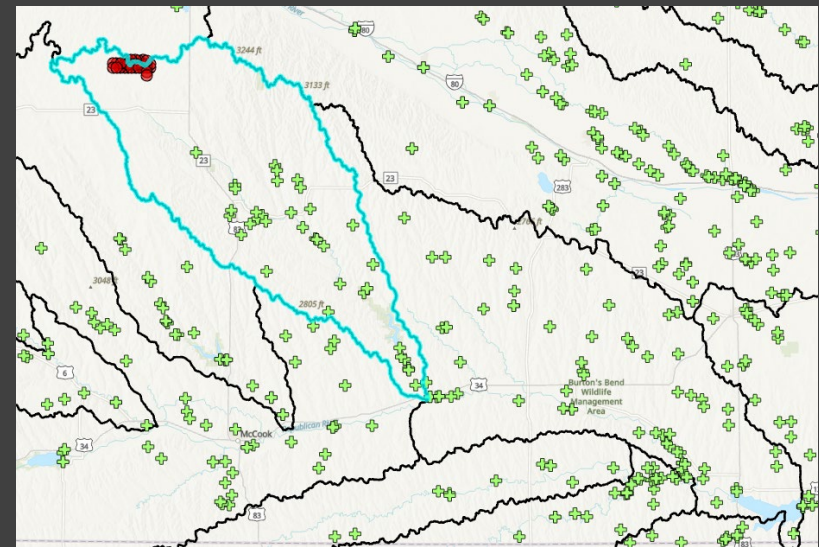
Augmentation Impacts – Rock Creek Offsets

Annual Offset from Decertified and Retired Historical Uses Affecting and Upstream of the Rock Creek and Republican River Confluence



N-CORPE Offsets Discussion

- Net depletions are to Medicine Creek
- Consideration of users impacted by depletions
- NRD management action to consider



Hydrologically Balanced Assessment

For the IMP for the Republican Basin
Portion of Tri-Basin NRD

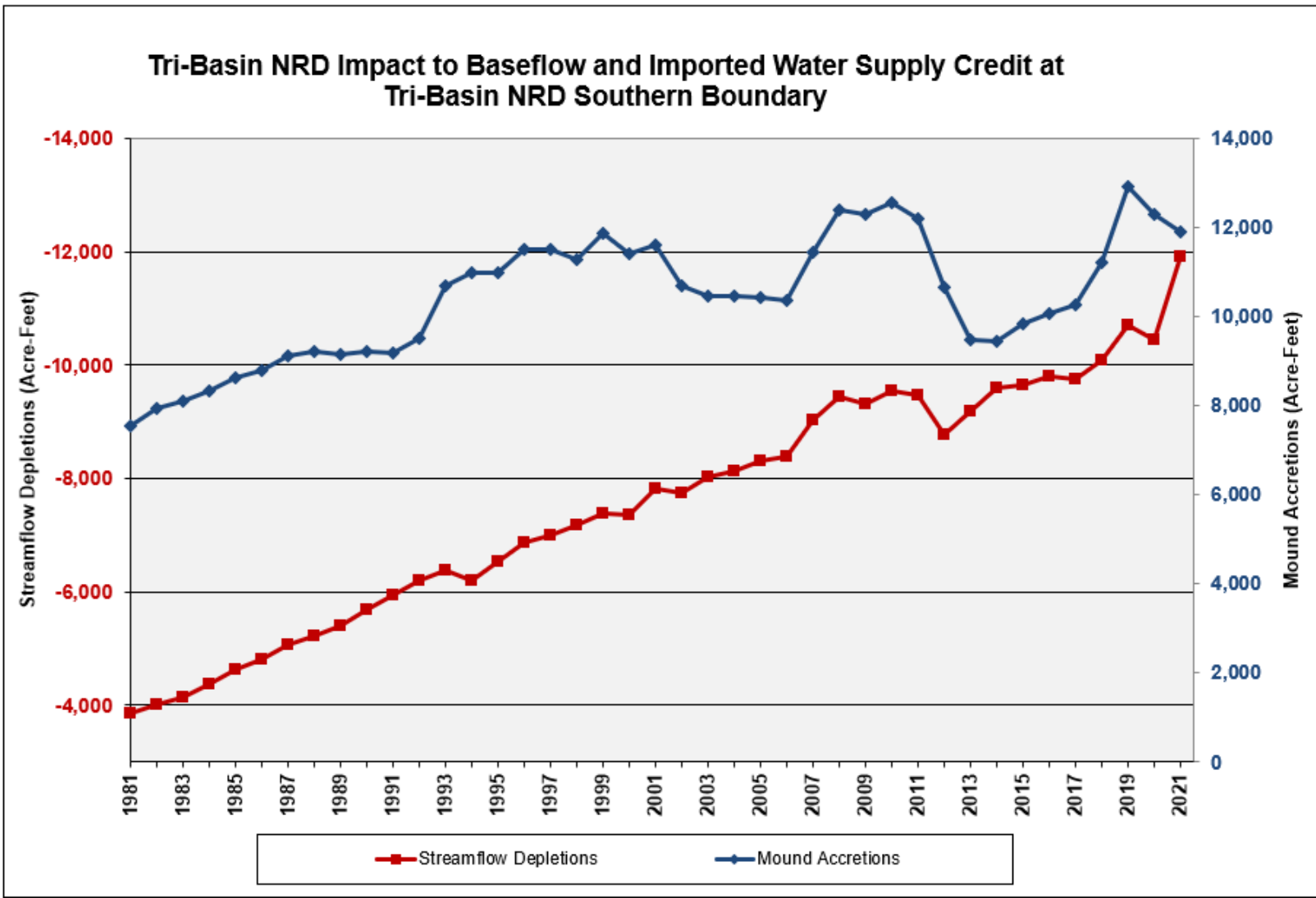
Goal A, Objective 1

“Revise existing NRD integrated water management rules and regulations, to the extent necessary, to insure **that the NRD will incrementally achieve and sustain a hydrologically “balanced” condition** so that, in combination with imported water contributions from the Platte basin, streamflow augmentation and other management actions, Tri-Basin NRD water users will not cause a net depletion to streamflow.....**Under a hydrologically balanced condition in the context of this plan, baseflow impacts and the mound credit will be equal.**”

Assessment

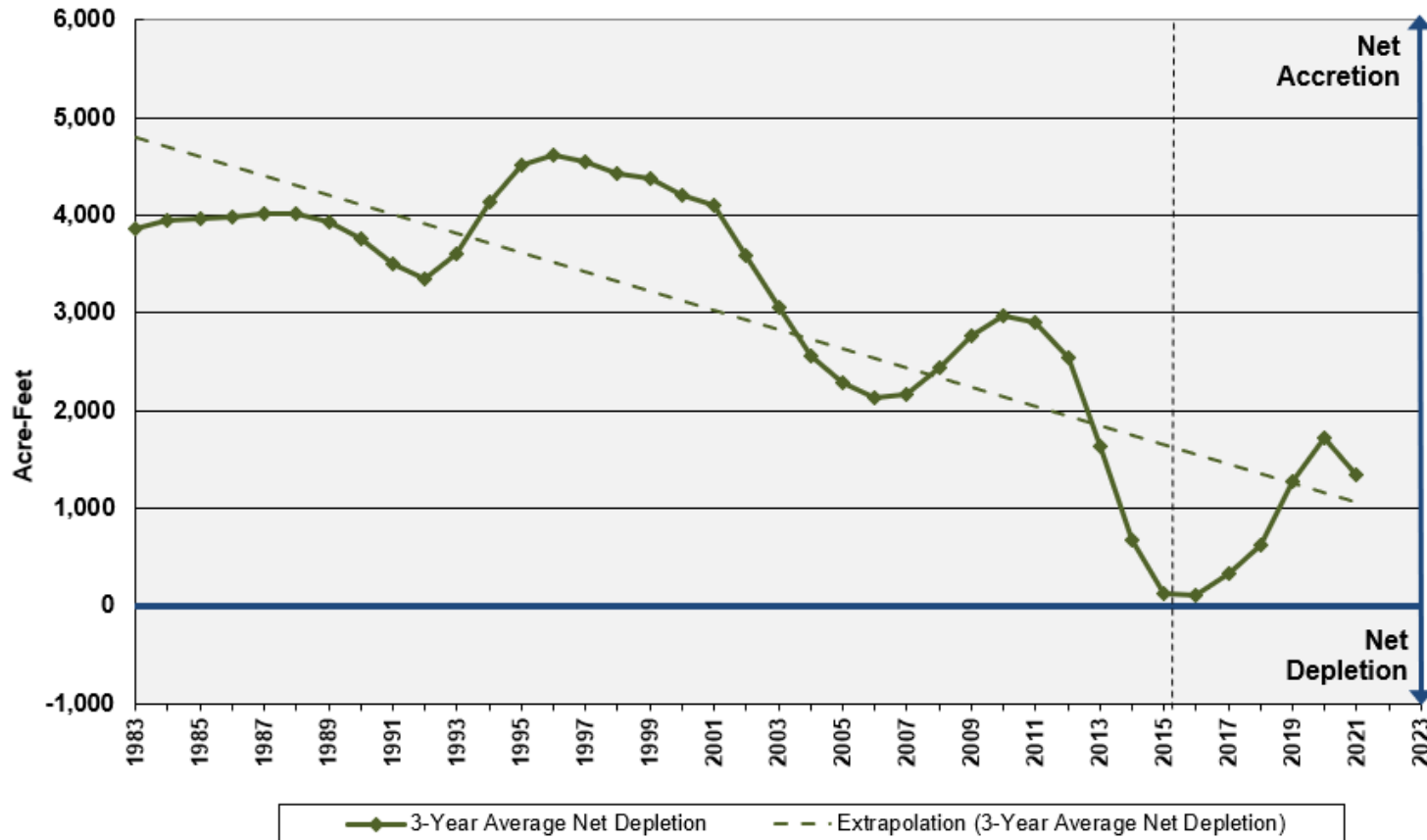
“Goal A Objective 1 of this IMP is to establish a hydrologically ‘balanced’ condition in which Tri-Basin NRD water users will **not cause a net depletion to streamflow of the Republican basin when evaluated on a three-year rolling average basis**.”

Modeled Depletions and Accretions, 1981 – 2021



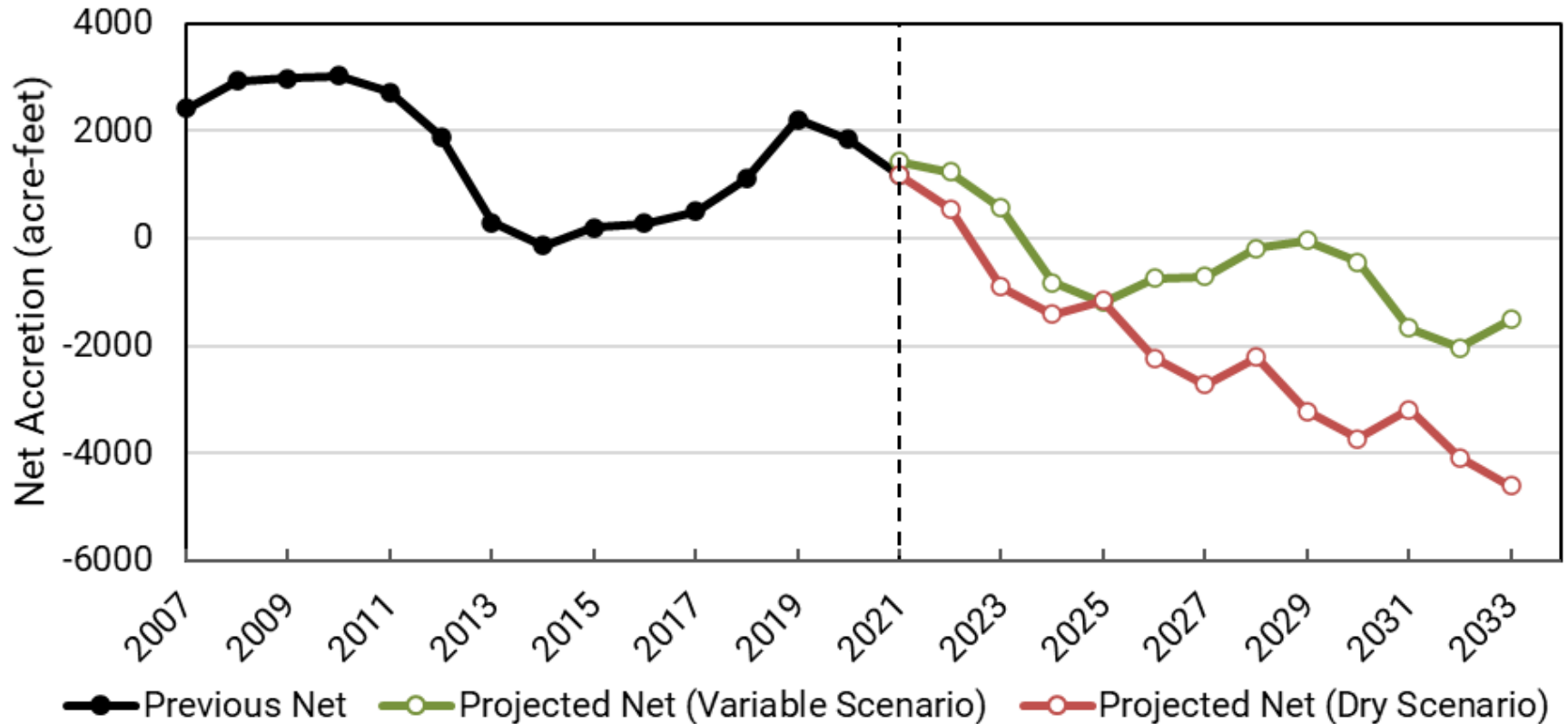
Hydrologically Balanced Assessment

Tri-Basin NRD 3-Year Average Net Effect to Baseflow at
Tri-Basin NRD Southern Boundary



Projected Net Accretion

Annual Net Accretion under **Variable** and **Dry** Scenarios



In 2024 the 3-year average net accretion will be negative (-589 ac-ft).

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245 Fallbrook
Blvd.
Lincoln, NE
68521

402-471-2363